Abstract Submitted
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Measurement of a three-dimensional circuit QED system with a down-converting parametric amplifier[1] CHAD RIGETTI, DOUG MCCLURE, IBM T. J. Watson Research Center, LAFE SPIETZ, Brooklyn Quantum Works, JAY GAMBETTA, STEFANO POLETTO, ERIK LUCERO, ANTONIO CORCOLES, JERRY CHOW, JIM ROZEN, MATTHIAS STEFFEN, MARK KETCHEN, IBM T. J. Watson Research Center, KATRINA SLIWA, FLAVIUS SHACKERT, MICHAEL HATRIDGE, BALEEGH ABDO, MICHEL DEVORET, Department of Applied Physics, Yale University — We describe measurements of a superconducting transmon qubit in a waveguide cavity with a Josephson Parametric Converter (JPC) operated as a down-converter with gain. The JPC signal mode is matched to the waveguide cavity at approximately 11.2GHz while the amplified signal, taken from the idler port, is roughly an octave lower at 5.5GHz. Operating the system in this down-conversion-with-gain mode makes use of the JPC's capability to act as both a parametric amplifier and a noiseless frequency converter. Further, it decouples the qubit measurement frequency from the functional frequencies of all components following the JPC in the measurement chain. This work thus provides a framework for a turnkey near-quantum-limited measurement chain which can be standardized and optimized over a narrow band without placing constraints on the qubit/cavity system.

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